

MANGROVE ECOSYSTEMS

**A MANUAL FOR THE ASSESSMENT
OF BIODIVERSITY**

**A follow up of the
National Agricultural Technology Project
(NATP.), ICAR.**

*Mangrove Ecosystem Biodiversity :
Its Influence on the Natural Recruitment of
Selected Commercially Important Finfish and Shellfish
Species in Fisheries*

Edited by :
Dr. George J. Parayannilam



Central Marine Fisheries Research Institute
(Indian Council of Agricultural Research)

P.B. No. 1603, Ernakulam North P.O; Cochin – 682 018, Kerala, India







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A Manual for the Assessment of Biodiversity

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Avian Fauna

S. K. Chakraborty, Sunirmal Giri, Gurudas Chakravarty, S. Dam Roy and A. K. Sadhu

The mangroves together with the extensive areas of mudflats and sandflats provide a wide range of niches for avian species. Different workers like - Osmaston (1904), Roonwal (1939), Saha *et al.* (1971) and Majumder *et al.* (1992) have contributed to the knowledge of Ornithology of Mangrove

Ecosystem which is attracted by large number of birds both in reclaimed areas and in the mangrove forest. More than 300 species have been recorded earlier from mangroves area in which a number of them are migratory (Choudhury and Choudhury, 1994)

A list of Birds recorded from Mangrove Ecosystems.

Species	Common name
Class - Aves Sub-Class - Neornithes Super-Order - Neognathae Order - Pelecaniformes Family - Phalacrocoracidae	
<i>Phalacrocorax niger</i> (Vieillot)	Little Cormorant
<i>Phalacrocorax carbo</i> (Linnaeus)	Large Cormorant
Order - Ciconiiformes	
Family - Ardeidae	
<i>Ardea cinerea</i> Linnaeus	Grey Heron
<i>A. purpurea manilensis</i> Meyen	Eastern Purple Heron
<i>Bubulcus ibis coromandus</i> (Boddaert)	Cattle Egret
<i>Egretta intermedia intermedia</i> (Wagler)	Smaller or Median Egret
<i>E. garzetta garzetta</i> (Linnaeus)	Little Egret
<i>Nycticorax nycticorax nycticorax</i> (Linnaeus)	Night Heron
Family - Ciconiidae	
<i>Anastomus oscitans</i> (Boddaert)	Openbill Stork
Family - Threskiornithidae	
<i>Threskiornis aethiopica melanocephala</i> (Latham)	White Ibis
Order - Anseriformes	
Family - Anatidae	
<i>Dendrocygna javanica</i> (Horsfield)	Lesser Whistling Teal
Order - Falconiformes	

Species	Common name
Family - Accipitridae	
<i>Haliastur indus indus</i> (Boddaert)	Brahminy Kite
<i>Milvus migrans govinda</i> (Sykes)	Pariah Kite
<i>Haliaeetus leucoryphus</i> (Pallas)	Ringtailed or Pallas's Fishing Eagle
Order - Galliformes	
Family - Phasianidae	
<i>Gallus gallus murghi</i> Robinson & Kloss	Indian Red Jungle Fowl
Order - Gruiformes	
Family - Rallidae	
<i>Amaurornis phoenicurus chinensis</i> (Boddaert)	Chinese Whitebreasted Waterhen
Order - Charadriiformes	
Family - Charadriidae	
<i>Vanellus indicus indicus</i> (Boddaert)	Redwattled Lapwing
<i>Pluvialis dominica fulva</i> (Gmelin)	Eastern Golden Plover
<i>Gallinago gallinago gallinago</i> (Linnaeus)	Fantail Snipe
<i>Calidris minuta</i> (Leisler)	Little Stint
Order - Apodiformes	
Family - Apodidae	
<i>Apus affinis affinis</i> (J.E.Gray)	Indian House Swift
<i>Cypsiurus parvus batasiensis</i> (J.E.Gray)	Indian Palm Swift
Order - Coraciiformes	
Family - Alcedinidae	
<i>Ceryle rudis leucomelanura</i> Reichenbach	Indian Pied Kingfisher
<i>Alcedo atthis bengalensis</i> Gmelin	Indian Small Blue Kingfisher
Family - Meropidae	
<i>Merops orientalis orientalis</i> Latham	Indian Small Green Bee-eater
Order - Piciformes	
Family - Picidae	
<i>Dinopium benghalense benghalense</i> (Linnaeus)	Northern Goldenbacked Woodpecker
Order - Passeriformes	
Family - Dicruridae	
<i>Dicrurus adsimilis albirictus</i> (Hodgson)	North Indian Black Drongo
<i>D. caerulescens caerulescens</i> (Linnaeus)	Indian Whitebellied Drongo
Family - Sturnidae	
<i>Acridotheres fuscus fuscus</i> (Wagler)	Northern Jungle Myna
Family - Muscicapidae	

<i>Monticola cinclorhynchus</i> (Vigors)	Bullheaded Rock Thrush
<i>M. solitarius pandoo</i> (Sykes)	Indian Blue Rock Thrush
Family - Motacillidae	
<i>Motacilla flava beema</i> (Sykes)	Blueheaded Yellow Wagtail
Family - Nectariniidae	
<i>Nectarinia asiatica asiatica</i> (Latham)	Indian Purple Sunbird
Family - Ploceidae	
<i>Ploceus philippinus philippinus</i> (Linnaeus)	Indian Baya
<i>Lonchura punctulata punctulata</i> (Linnaeus)	Indian Spotted Munia

Class - Aves.

Body is covered by feathers; fore limbs are modified as wings and have powerful flight muscle; Body spindle shaped; bones are pneumatic; Air sac present; a sound producing organ, *syrinx* is present.

Sub-class - Neornithes.

Short tail with a terminal pygostyle and with semicircularly arranged feathers; teeth absent; usually the claws are not present in more than two digits; well developed sternum bears a distinct *keel* or *carina*.

Super-order - Neognathae.

The slender vomer separates the palatines imperfectly; the palatines are protruded posteriorly to be in contact with the base of the cranium and remain movably articulated with small pterygoids - this type of jaw arrangement is known as neognathous condition; they are able to fly; most of them possess *keel* or *carina*.

Order - Pelecaniformes.

All are aquatic and fish-eaters; long beaks have wide gap; size is usually large and body is adapted for diving; hind limb has four digits which are completely webbed; they make nests in a colony and feed the nestlings by regurgitated food.

Order - Ciconiiformes.

All the birds have long naked legs and long bills; the legs are adapted for walking on marshes and mudflats; four toes are present in each foot which only in one family (Phaenicopteridae) are webbed; the beak has sharp-cutting edges.

Order - Anseriformes.

Beak is provided with special tectile organ to help in selecting food; all the toes are webbed.

Order - Falconiformes.

Body is strongly built with prominent hook-like beak with cutting edge and the feet are provided with curved pointed claws in the digits; the lower beak remains enclosed by the upper beak, bears wart-like variegatedly coloured protruberance called *cere* which is pierced by nostrils; feathers are stiff and cover the legs except the digits; eyes are laterally placed.

Order - Galliformes.

Head small but body compact; the legs are massive, clawed and used for scratching the soil to search food; three toes are anteriorly directed and one is posteriorly directed; in most members, the wings are short and round; the beaks are strongly built and arches, most suitable for picking up grains and seeds; sexual dimorphism presents.

Order - Gruiformes.

Primarily aquatic but some have settled in grassland and some have become reed dwellers; toes are not webbed; nests are built on the ground.

Order - Charadriiformes.

Live near water, some live on shore, some on aquatic leaves and some become aquatic; feet show various modifications according to habitats.

Order - Apodiformes.

These birds have short legs and long wings; they can fly very swiftly; and are usually insect feeders but humming birds take nectar in swifts; the mouth is broad and eyes are large; in humming birds, the tongue is protrusible and wings can perform hovering movement.

Order - Coraciiformes.

In most species, the wings and legs are short; the beak is long; body is brightly coloured and nests are

built up as holes in the trees; in some forms a few anteriorly directed toes are fused (syndactylous) and in others one of the toes is reversed (zygodactylous).

Order - Piciformes.

The most important character is the occurrence of zygodactylous feet, second and third toes are directed forward and the first and fourth are pointed backwards; usually insectivorous but some forms may be herbivorous; most members prepare nest in holes but one family (Indicatoridae) lays eggs in the nests of other birds.

Order - Passeriformes.

All are adapted to land life and in all, the four digit are present at the same level; nestlings are hatched only with a few feather tracts and are helpless at the beginning.

Diagnostic characters of different species :-

Order - Phelecaniformes

Family - Phalacrocoracidae

Genus - *Phalacrocorax* Brisson, 1760

Neck and body long, rather spindle-shaped, bill laterally compressed.

1. *Phalacrocorax niger* (Vieillot, 1817)

[Common name - Little cormorant]

A glistening black duck-like bird; a short crest on occiput and neck; bill stouter; a small white patch on throat; forehead domed shaped, stiff long tail; sexes alike.

2. *Phalacrocorax carbo* (Linnaeus, 1801)

[Common name - Large cormorant]

A black duck-like water bird with slender bill, hooked at tip; tail longish and stiff; facial skin and throat white; gular pouch bright yellow.

Order - Ciconiiformes

Family - Ardeidae

Genus - *Ardea* Linnaeus, 1758

Large sized, above 97 cm.

3. *Ardea cinerea* Linnaeus, 1758

[Grey Heron]

Ashy-gray with white crown and neck with a long black occipital crest below a prominent black dotted line down middle of foreneck; leg and neck very long; breast with elongated black-streaked white feathers; abdominal feathers grayish white.

4. *A. purpurea manilensis* Meyen, 1834

[Common name - Eastern purple heron]

Purplish blue or slaty bird with blackish wing and tail; crown and crest slaty black, rest of head and neck ferruginous with boldly striped-black; chin and throat white; upper breast buffy-white with black and chestnut streaks; abdomen slaty black and chestnut.

Genus - *Bubulcus* Bonaparte, 1855

Medium or small-sized, below 63 cm; plumage mainly white in colour; head and neck white throughout; bill yellow in colour.

5. *Bubulcus ibis coromandus* (Boddaert, 1783)

[Common name - Cattle egret] (Fig. 1)

A snow white bird usually seen on or with grazing cattle; bill yellow; orbital and facial skin greenish yellow; legs and feet black; during breeding head, neck and back the golden buff feathers disintegrate and hair like.

Genus - *Egretta* Forster, 1817

Medium or small-sized, below 63 cm; plumage mainly white in colour; head and neck white throughout; bill black in colour.

6. *Egretta intermedia intermedia* (Wagler, 1829) (Fig. 2)

[Common name - Smaller or median egret]

Plumage entirely white; occipital crest absent; in breeding, on back as well as on breast presence of decomposed filamentous plumes; legs and feet black; bill black; yellow at base in breeding season.

7. *E. garzetta garzetta* (Linnaeus, 1766)

[Common name - Little egret]

Size equal to hen. Plumage snow-white, bill black; legs black, feet orange yellow; in breeding season, nuchal crest of two long narrow plumes and filamentous feathers on back and breast.

Genus - *Nycticorax* T. Forster, 1817

Medium or small-sized, below 63 cm; plumage generally white and grey in colour.

8. *Nycticorax nycticorax nycticorax* (Linnaeus, 1758)

[Common name - Night heron]

Size equal to Pond Heron; bill stout, back and scapular ashy-grey with greenish black; forehead

and sides of head white; occipital crest, crown and nape black; sides of breast and belly ashy-grey; legs and feet dull green; young birds streaked brown; sex alike.

Family - Ciconiidae

Genus - *Anastomus* Bonnaterre, 1791

Mandibles leaving open space near middle of bill.

9. *Anastomus oscitans* (Boddaert, 1783)

[Common name - Openbill Stork]

Size equal to large duck; bill reddish black with arching mandibles leaving a narrow open gap between them is diagnostic; legs and feet pinkish brown; neck, back and breast white, mantle, wings and tail greenish black.

Family - Threskiornithidae

Genus - *Threskiornis* G.R.Gray, 1842

Bill slender, slightly downcurved, neck bare; plumage usually white, nostril linear.

10. *Threskiornis aethiopica melanocephala* (Latham, 1790)

[Common name - White Ibis]

A large white marsh bird; entire plumage except head and neck snow white, head and neck black; bill down curved, long and stout; in breeding season plumage some slaty gray on scapulars and in wings and ornamental plumes at base of neck.

Order - Anseriformes

Family - Anatidae

Genus - *Dendrocygna* Swainson, 1837

Hind toe narrowly lobed; bill rather flat and broad; primaries equal to secondaries in length.

11. *Dendrocygna javanica* (Horsfield, 1821)

[Common name - Lesser Whistling Teal or Tree Duck]

Small pale brown and maroon-chestnut coloured bird; upper tail-coverts uniformly chestnut; sexes alike; feeble, flapping, jacana-like flight accompanied by the constantly uttered shrill whistling.

Order - Falconiformes

Family - Accipitridae

Genus - *Haliastur* Selby, 1840.

Head and neck feathered; upper mandible without

teeth; lores unfeathered; tarsus short, less than two times length of bill from tip to gape; front of tarsus scutellate; tail not forked; fourth primary longest.

12. *Haliastur indus indus* (Boddaert, 1783)

[Common name - Brahminy Kite]

Size slightly smaller; head, neck, upper back and breast white; lower back, wings, abdomen and tail rusty red or deep chestnut; tips of wings black; Immature birds chocolate - brown in colour.

Genus - *Haliaeetus* Savigny, 1809

Head and neck feathered; upper mandible without teeth; lores unfeathered; tarsus short, less than two times length of bill from tip to gape; front of tarsus scutellate; tail not forked; third primary longest.

13. *Haliaeetus leucoryphus* (Pallas, 1771)

[Common name - Ringtailed or Pallas's Fishing Eagle]

Size bigger than kite; back and wings dark brown, head, neck and upper back pale golden brown; tail white with terminal band, legs and feet dull white; females are larger than male.

Genus - *Milvus* Lacepede, 1799.

Head and neck feathered; upper mandible without teeth; lores unfeathered; tarsus short, less than two times length of bill from tip to gape; front of tarsus scutellate; tail forked.

14. *Milvus migrans govinda* (Sykes, 1832)

Head, back and tail dark fulvous-brown; bill black, legs and feet yellow, claws black; tail deeply forked.

Order - Galliformes

Family - Phasianidae

Genus - *Gallus* Brisson, 1760

No ocellations on tail or tail coverts; wing over 200mm; a flesh erect comb on the crown.

15. *Gallus gallus murghi* Robinson & Kloss, 1920

[Common name - Indian Red Jungle fowl] (Fig. 3)

Size equal to a domestic Fowl; hen differ from cock; in cock, back with orange red and yellow hackles on neck and rump; under parts uniformly black, wings with bright blue wing patches; in

hen, back reddish brown finely vermiculated with buff and black; under parts light rufous brown.

Order - Gruiformes

Family - Rallidae

Genus - *Amaurornis*

Bill from gape much shorter than tarsus; frontal shield absent to slightly developed; quill three to six longest; first shorter than eight.

16. *Amaurornis phoenicurus chinensis* (Boddaert, 1783)

[Common name - Chinese Whitebreasted waterhen] (Fig. 4)

Crown, hind neck, wings, back and stubby tail dark slaty grey; forehead, sides of head, chin, throat, breast and belly pure white; vent and under tail coverts rufous; legs and feet yellowish green; the base of upper mandible red.

Order - Charadriiformes

Family - Charadriidae

Genus - *Vanellus* Brisson, 1760

Tails with broad black band and often with a narrow white terminal band.

17. *Vanellus indicus indicus* (Boddaert, 1783) (Fig. 5)

[Common name - Redwattled Lapwing]

Back and wings bronze-brown; head, neck and breast black; a creamson fleshy wattles in front of each eye; a broad white band behind eyes running down sides of neck and wings to meet the white underparts.

Genus - *Pluvialis* Brisson, 1760

Tail with narrowly barred; black spotted.

18. *Pluvialis dominica fulva* (Gmelin, 1789)

[Common name - Eastern Golden Plover] (Fig. 6)

Thick head, slender bare legs, pigeon-like bill; brown above, spangled with white and gold; whitish below mottled on breast with brown, grey, yellow; in breeding seasons plumage underparts black; axillaries grey.

Genus - *Gallinago* Brisson, 1760

19. *Gallinago gallinago gallinago* (Linnaeus, 1758)

[Common name - Fantail Snipe] (Fig. 7)

Back dark brown, heavily streaked with black, rufous and buff; underparts whitish; Bill straight

slender, about $2\frac{1}{2}$ inches in length, yellowish horny on basal half, dark horny brown on terminal half; Three outer pairs of tail feathers marked with dusky spots and bars; sexes alike.

Genus - *Calidris* Merrem, 1804

Tibia unfeathered; toes divided; bill not spoon-shaped; and not sharply pointed; tip of bill slightly expanded.

20. *Calidris minuta* (Leisler, 1812)

[Common name - Little Stint]

Back mottled greyish brown; underparts white; rump and middle tail feathers dark brown; outer tail feathers smoky brown; bill and legs black; wings with narrow wing bar; summer plumage richer - more black and rufous.

Order - Apodiformes

Family - Apodidae

Genus - *Apus* Scopoli, 1777

Four toes directed forward though 1st reversible.

21. *Apus affinis affinis* (J.E. Gray, 1830)

[Common name - Indian House Swift]

Crown brown, forehead more grey but no white and no trace of supercilium; bill horny black; throat and rump white; legs and feet pinkish brown.

Genus - *Cypsiurus* Lesson, 1843

Toes arranged in pairs, 3rd and 4th outward, 1st and 2nd inward.

22. *Cypsiurus parvus batasiensis* (J.E. Gray, 1829)

[Common name - Indian Palm Swift] (Fig. 8)

A small swift with narrow deeply forked tail; toes arranged in pairs, the 3rd and 4th toes outward, the 1st and 2nd inward; wings long slender bow-like.

Order - Coraciiformes

Family - Alcedinidae

Genus - *Ceryle* Boie, 1828

Plumage black and white.

23. *Ceryle rudis leucomelanura* Reichenbach, 1851

[Common name - Indian Pied Kingfisher] (Fig. 9)

Medium sized bird (between Myna and Pigeon); plumage black and white; bill long and

compressed; wings rather pointed; tail longer; it can be easily identified by its spectacular habit of “Standing on its tail” in mid-air, hovering over water; female similar to male but with a single black gorget broken in the middle, as against two more or less complete ones in the male.

Genus - *Alcedo* Linnaeus, 1758.

Plumage not black and white; tail shorter than bill.

24. *Alcedo atthis bengalensis* Gmelin, 1788

[Common name - Indian small Blue Kingfisher] (Fig. 10)

A small blue kingfisher with a white patch on side of neck; throat white, chest and belly light rusty coloured; bill long, straight and pointed; short stumpy tail.

Family - Meropidae

Genus - *Merops* Linnaeus, 1758.

25. *Merops orientalis orientalis* Latham, 1801

[Common name - Indian Small Green Bee-eater] (Fig. 11)

Size equal to Sparrow. Back and underparts grass-green; head and neck tinged with reddish brown. Central pairs of tail feathers project beyond tail as blunt pins. Bill slender, long and slightly curved. Chin and throat verditer blue bordered by a black gorget.

Order - Piciformes

Family - Picidae

Genus - *Dinopium* Rafinesque, 1814

Nostrils exposed. Mantle golden olive, not banded. Hallux small, about one-third length of 2nd toe or lacking.

26. *Dinopium benghalense benghalense* (Linnaeus, 1758)

[Common name - Northern Goldenbacked Woodpecker] (Fig. 12).

In male, back golden yellow, neck; chin, throat and sides of neck black, finely streaked and stippled with black, more boldly on breast, crown and occipital crest crimson; in female, similar to male, but forehead black striped with white, only the occipital crest crimson.

Order - Passeriformes

Family - Dicruridae

Genus - *Dicrurus* Vieillot, 1816

27. *Dicrurus adsimilis albirictus* (Hodgson, 1836)

[Common name - North Indian Black Drongo] (Fig. 13)

Large sized bird; entire body, the head and tail glossy jet black; tail long, deeply forked; white rictal spot present.

28. *D. caerulescens caerulescens* (Linnaeus, 1758)

[Common name - Indian Whitebellied Drongo] (Fig. 14)

Head, back, tail and wings glossy indigo; throat, breast and belly brownish grey; under tail-coverts white; tail long and deeply forked.

Family - Sturnidae

Genus - *Acridotheres* Vieillot, 1816

Distinct white wing-patch on the underparts of the base of the wings.

29. *Acridotheres fuscus fuscus* (Wagler, 1827)

[Common name - Northern jungle Myna] (Fig. 15)

Size equal to common Myna, but greyish brown overall; wing with large white patch; forehead with a prominent tuft of erect black feathers at base of bill; tail broad white tipped; bill yellow-orange; legs and feet yellow-ochrea; In female cap dark grey.

Family - Muscicapidae

Genus - *Monticola* Boie, 1822

Sexes dissimilar; tail shorter than wing; white on bases of secondaries and part of primaries; plumage largely with blue or bluish.

30. *Monticola cinclorhynchus* (Vigors, 1832)

[Common name - Bullheaded Rock Thrush]

Size equal to Bulbul; a male with blue head throat and nape, wing with a white patch, shoulders blue; rump rufous, tail blackish blue; breast and belly orange rufous; female-head, back and tail olive brown; throat, breast and belly squamated whitish and dark brown.

31. *M. solitarius pandoo* (Sykes, 1832)

[Common name - Indian Blue Rock Thrush] (Fig. 16)

Size equal to Bulbul; in male, very bright, almost

azure blue plumage in summer; tail and wings brown; in summer plumage are fringed with fulvous above, breast brown, belly white; in female grey-brown on back; throat and breast with fine dark shag-streaks; Rump barred with blackish.

Family - Motacillidae

Genus - *Motacilla* Linnaeus, 1758.

Tail longer, upper plumage unstreaked.

32. *Motacilla flava beema* (Sykes, 1832)

[Common name - Blueheaded Yellow Wagtail] (Fig. 17)

Size almost equal to a sparrow; slim, long-tailed bird; back olive; head pale grey; Supercilium prominent; chin and malar streak white.

Family - Nectariniidae

Genus - *Nectarinia* Illiger, 1811.

Central rectrices not elongated; plumage in male metallic, female greenish below.

33. *Nectarinia asiatica asiatica* (Latham, 1790)

[Common name - Indian Purple Sunbird] (Fig. 18)

Male with metallic dark blue and purple on back; throat and breast metallic purple, sides blue-green; abdomen dark purple separated from breast by a narrow, inconspicuous reddish brown band; pectoral tufts bright yellow and scarlet; female olive brown; throat, chest and abdomen dull yellow.

Family - Ploceidae

Genus - *Ploceus* Cuvier, 1816

Bill short and stout, 1st primary minute, 2nd, 3rd, 4th and 5th longest.

34. *Ploceus philippinus philippinus* (Linnaeus, 1766)

[Common name - Indian Baya] (Fig. 19)

In breeding male, crown yellow, upper parts dark brown streaked with yellow on back; breast yellow, abdomen cream buff; female, crown and back yellowish; buff streaked with dark brown; throat white, tinged with yellow; yellowish buff breast, belly cream buff; stout conical bill; short square-cut tail.

Genus - *Lonchura* Sykes, 1832

Bill broad at base, stout; wing reaching almost in the middle part of tail.

35. *Lonchura punctulata punctulata* (Linnaeus, 1758)

[Common name - Indian Spotted Munia] (Fig. 20)

Size-less than a house sparrow, chocolate-brown with faint pale shaft-streaks above; undertail coverts fulvous, rump barred with white; tail tawny-olive; sides of head, neck and throat chestnut; breast speckled black and white; belly white.

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Fig. 1. *Bubulcus ibis coromandus*



Fig. 2. *Egretta intermedia intermedia*



Fig. 3. *Gallus gallus murghi*



Fig. 4. *Amaurornis phoenicurus chinensis*



Fig. 5. *Vanellus indicus indicus*



Fig. 6. *Pluvialis dominica fulva*



Fig. 7. *Gallinago gallinago gallinago*



Fig. 8. *Cypsiurus parvus batasiensis*

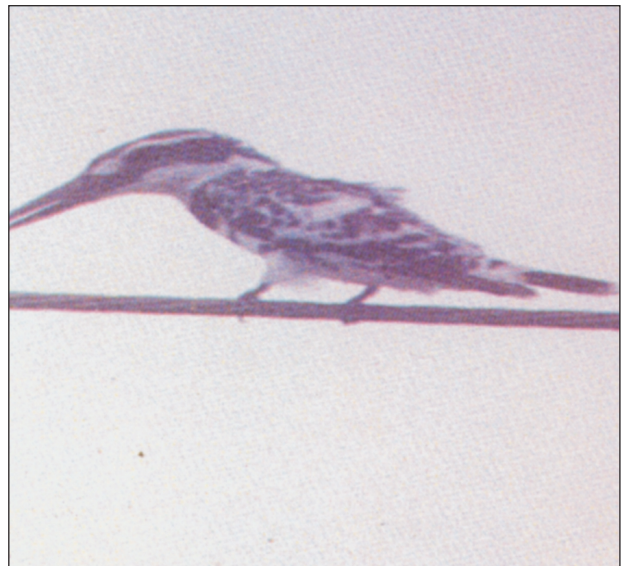


Fig. 9. *Ceryle rudis leucomelanura*



Fig. 10. *Alcedo atthis bengalensis*



Fig. 11. *Merops orientalis orientalis*



Fig. 12. *Dinopium benghalense benghalense*



Fig. 13. *Dicrurus adsimilis albirictus*



Fig. 14. *Dicrurus caerulescens caerulescens*



Fig. 15. *Acridotheres fuscus fuscus*



Fig. 16. *Monticola solitarius pandoo*



Fig. 17. *Motacilla flava beema*



Fig. 18. *Nectarinia asiatica asiatica*



Fig. 19. *Ploceus philippinus philippinus*



Fig. 20. *Lonchura punctulata punctulata*